

* CHAPTER 7. NDB WITH FAF *

- * **700. GENERAL.** This chapter prescribes criteria for NDB procedures which incorporate a final approach fix. NDB procedures shall be based only on facilities which transmit a continuous carrier. *

701.-709. RESERVED.

Section 1. NDB With FAF

710. FEEDER ROUTES. Criteria for feeder routes are contained in paragraph 220

711. INITIAL APPROACH SEGMENT. Criteria for the initial approach are contained in Chapter 2, Section 3.

712. INTERMEDIATE APPROACH SEGMENT. Criteria for the intermediate approach segment are contained in Chapter 2, Section 4.

713. FINAL APPROACH SEGMENT. The final approach may be made either FROM or TOWARD the facility. The final approach segment begins at the final approach fix and ends at the runway or missed approach point, whichever is encountered last.

- * **NOTE:** Criteria for the establishment of arc final approaches are specified in paragraph 523b. *

a. Alignment. The alignment of the final approach course with the runway centerline determines whether a straight-in or circling-only approach may be established. The alignment criteria differs depending on whether the facility is OFF or ON the airport. See definition in paragraph 400.

(1) Off-Airport Facility.

(a) Straight-in. The angle of convergence of the final approach course and the extended runway centerline shall not exceed 30°. The final approach course should be aligned to intersect the runway centerline at the runway threshold. However, when an operational advantage can be achieved, the point of intersection may be established as much as 3,000 feet outward from the runway threshold. See Figure 61.

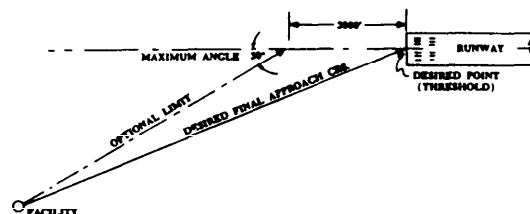


Figure 61. ALIGNMENT OPTIONS FOR FINAL APPROACH COURSE. Off-Airport NDB with FAF. Straight-in Approach. Par 713.a.(1)(a).

(b) Circling Approach When the final approach course alignment does not meet the criteria for straight-in landing, only a circling approach shall be authorized, and the alignment should be made to the center of the landing area. When an operational advantage can be achieved, the final approach course may be aligned to any portion of the usable landing surface. See Figure 62.

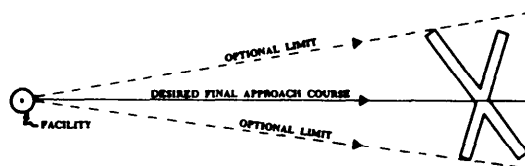


Figure 62. ALIGNMENT OPTIONS FOR FINAL APPROACH COURSE. Off-Airport NDB with FAF. Circling Approach. Par 713.a.(1)(b).

(2) On-Airport Facility.

(a) Straight-in. The angle of convergence between the final approach course and the extended runway centerline shall not exceed 30 degrees. The final approach course should be aligned to intersect the extended runway centerline 3,000 feet outward from the runway threshold. When an operational advantage can be achieved, this point of intersection may be established at any point between the runway threshold and a point 5,200 feet outward from the runway threshold. Also, where an operational advantage can be achieved, a final approach course which does not intersect

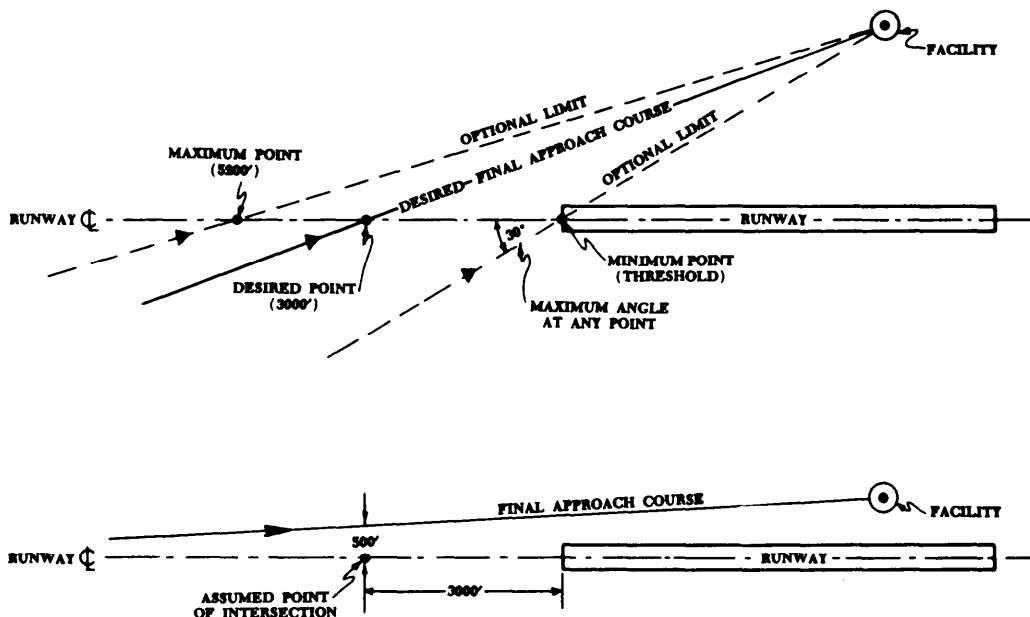


Figure 63. ALIGNMENT OPTIONS FOR FINAL APPROACH. On-airport NDB. Par 713.a.(2)(a).

the runway centerline, or which intersects it at a distance greater than 5,200 feet from the threshold, may be established provided such a course lies within 500 feet laterally of the extended runway centerline at a point 3,000 feet outward from the runway threshold. See Figure 63.

(b) *Circling Approach.* When the final approach course alignment does not meet the criteria for a straight-in landing, only a circling approach shall be authorized, and the course alignment should be made to the center of the landing area. When an operational advantage can be achieved, the final approach course may be aligned to any portion of the usable landing surface. See Figure 64.

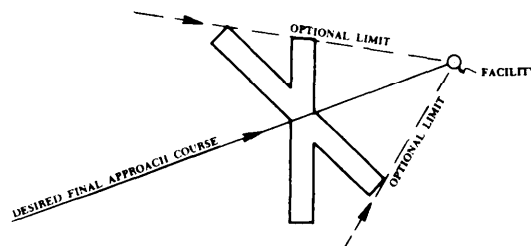


Figure 64. ALIGNMENT OPTIONS FOR FINAL APPROACH COURSE. On-Airport NDB with FAF. Circling Approach. Par 713.a.(2)(b).

b. *Area.* The area considered for obstacle clearance in the final approach segment starts at the final approach fix and ends at the runway or missed approach point, whichever is encountered last. It is a portion of a 15-mile long trapezoid (see Figure 65) which is made up of primary and secondary areas. The primary area is centered longitudinally on the final approach course. It is 2.5 miles wide at the facility and expands uniformly to 5 miles at 15 miles from the facility. A secondary area is on each side of the primary area. It is zero miles wide at the facility, and

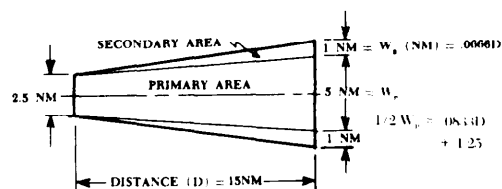


Figure 65. FINAL APPROACH TRAPEZOID. NDB with FAF. Par 713.b.

expands uniformly to 1 mile each side of the primary area at 15 miles from the facility. Final approaches may be made to airports which are a maximum of 15 miles from the facility. The OPTIMUM Length of the final approach segment is 5 miles. The MAXIMUM length is 10 miles. The MINIMUM length of the final approach segment shall provide adequate distance for an aircraft to make the required descent, and to regain course alignment when a turn is required over the facility. The following table shall be used to determine the minimum length needed to regain the course:

Table 15. MINIMUM LENGTH OF FINAL APPROACH SEGMENT - NDB (Miles)

Approach Category	Magnitude of Turn over Facility		
	10°	20°	30°
A	1.0	1.5	2.0
B	1.5	2.0	2.5
C	2.0	2.5	3.0
D	2.5	3.0	3.5
E	3.0	3.5	4.0

NOTE: This table may be interpolated. If turns of more than 30 degrees are required, or if the minimum lengths specified in the table are not available for the procedure, straight-in minimums are NOT authorized. See Figure 66 for typical final approach areas.

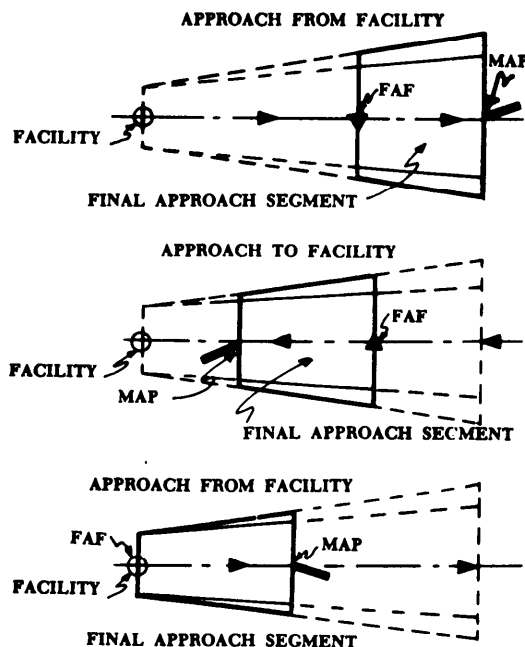


Figure 66. TYPICAL FINAL APPROACH AREAS. NDB with FAF. Par 713.b.

c. Obstacle Clearance.

(1) **Straight-In.** The minimum obstacle clearance in the primary area is 300 feet. In the secondary area 300 feet of obstacle clearance shall be provided at the inner edge, tapering uniformly to zero feet at the outer edge. The minimum obstacle clearance at any given point in the secondary area is as shown in Appendix 2, Figure 126.

(2) **Circling Approach.** In addition to the minimum requirements specified in paragraph 713c(1), obstacle clearance in the circling area shall be as prescribed in Chapter 2, Section 6.

d. **Descent Gradient.** The OPTIMUM descent gradient in the final approach segment should not exceed 300 feet per mile. Where a higher descent gradient is necessary, the MAXIMUM permissible gradient is 400 feet per mile. See also paragraph 251 and 288a.

(1) **Straight-In Approach.** The descent gradient shall be computed using the distance from the FAF to the runway threshold and the difference in altitude between the altitude over the FAF and the touchdown zone elevation.

(2) **Circling Approach.** The descent gradient shall be computed using the distance from the FAF to the first usable portion of the landing surface and the difference in altitude between the altitude over the FAF and the circling MDA.

e. **Use of Fixes.** Criteria for the use of radio fixes are contained in Chapter 2, Section 8. Where a procedure is based on a procedure turn and an on-airport facility is the procedure turn fix, the distance from the facility to the FAF shall not exceed 4 miles.

f. **Minimum Descent Altitude.** Criteria for determining the MDA are contained in Chapter 3, Section 2.

714. MISSED APPROACH SEGMENT. Criteria for the missed approach segment are contained in Chapter 2, Section 7. The missed approach point and surface shall be established as follows:

a. Off-Airport Facilities.

(1) **Straight-In.** The missed approach point is a point on the final approach course which is NOT FARTHER from the FAF than the runway threshold. The missed approach surface shall commence over the missed approach point at the required height. See paragraph 274 and Figure 67.

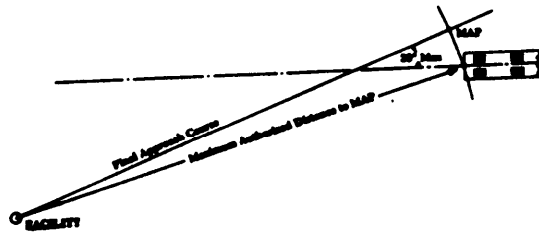


Figure 67. MISSED APPROACH POINT. Off-airport NDB with FAF. Par 714.a.(1).

(2) **Circling Approach.** The missed approach point is a point on the final approach course which is NOT FARTHER from the final approach fix than the first usable portion of the landing area. The missed approach surface shall commence over the missed approach point at the required height. See paragraph 274.

b. On-Airport Facilities. The missed approach point is a point on the final approach course which is NOT FARTHER from the final approach fix than the facility. The missed approach surface shall commence over the missed approach point at the required height. See paragraph 274.

* 715.-799. RESERVED. *

(1) **Straight-In.** The angle of convergence of the final approach course and the extended runway centerline shall not exceed 30 degrees. The final approach course should be aligned to intersect the runway centerline at the runway threshold. However, when an operational advantage can be achieved, the point of intersection may be established as much as 3000 feet outward from the runway threshold. See Figure 68.

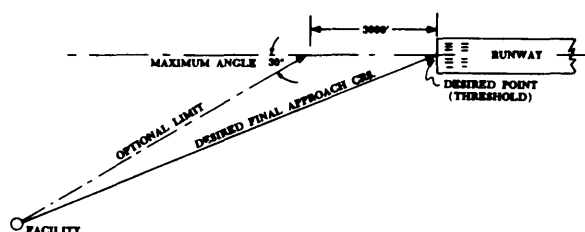


Figure 68. ALIGNMENT OPTIONS FOR FINAL APPROACH COURSE. L/MF Range with FAF. Straight-In approach. Par 733.a.(1).

(2) **Circling Approach.** When the final approach course alignment does not meet the criteria for a straight-in landing, only a circling approach shall be authorized, and the course alignment should be made to the center of the landing area. When an operational advantage can be achieved, the final approach course may be aligned to any portion of the usable landing area. See Figure 69.

b. Area. The area considered for obstacle clearance in the final approach segment starts at the final approach fix and ends at the runway or missed approach point, whichever is encountered last. It is a portion of a rectangle which is 10 miles long and 3.4 miles wide, centered longitudinally on the final approach course. There is no secondary area. See Figure 70. Final approaches may be made to air-

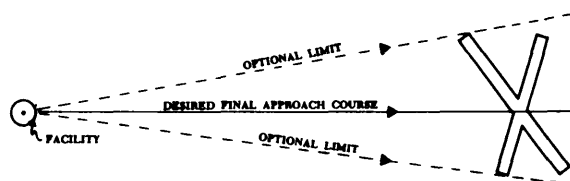


Figure 69. ALIGNMENT OPTIONS FOR FINAL APPROACH COURSE. L/MF Range with FAF. Circling approach. Par 733.a.(2).

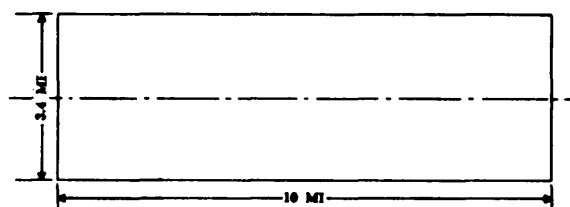


Figure 70. FINAL APPROACH OBSTACLE AREA. L/MF Range with FAF. Par 733.b.

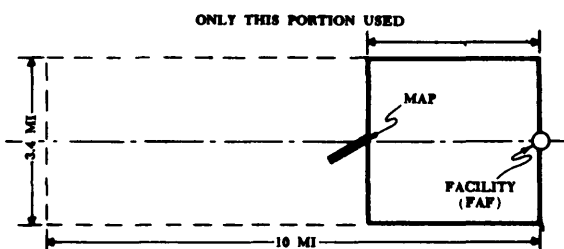


Figure 71. FINAL APPROACH SEGMENT. L/MF Range with FAF. Par 733.b.

ports which are a MAXIMUM of 10 miles from the facility. However, only that portion of the 10 mile rectangle which falls between the final approach fix and the missed approach point shall be considered as the final approach segment for obstacle clearance purposes. See Figure 71. The OPTIMUM length of the final approach segment is 5 miles. The MAXIMUM length is 10 miles. The MINIMUM length of the final approach segment shall provide adequate distance for an aircraft to make the required descent and to regain course alignment when a turn is required over the facility. The following table shall be used to determine the minimum length needed to regain course alignment.

Table 17. MINIMUM LENGTH OF FINAL APPROACH SEGMENT (MILES) L/MFR

Approach Category	Magnitude of Turn over the Facility		
	10°	20°	30°
A	1.0	1.5	2.0
B	1.5	2.0	2.5
C	2.0	2.5	3.0
D	2.5	3.0	3.5
E	3.0	3.5	4.0

NOTE: This table may be interpolated. If turns of more than 30 degrees are required, or if the minimum lengths specified in the table are not available for the procedure, straight-in minimums are not authorized.

c. Obstacle Clearance.

(1) **Straight-In.** The minimum obstacle clearance in the final approach segment is 300 feet.

(2) **Circling Approach.** In addition to the minimum requirements specified in Paragraph 733.c.(1) above, obstacle clearance in the circling area shall be as prescribed in Chapter 2, Section 6.

d. Descent Gradient. The OPTIMUM descent gradient in the final approach segment should not exceed 300 feet per mile. Where a higher descent gradient is necessary, the MAXIMUM permissible gradient is 400 feet per mile. See also Paragraph 251.

(1) **Straight-In.** The descent gradient shall be computed using the distance from the FAF to the runway threshold and the difference in altitude between the altitude over the FAF and the touchdown zone elevation.

(2) **Circling Approach.** The descent gradient shall be computed using the distance from the FAF to the first usable portion of the landing surface, and the difference in altitude between the altitude over the FAF and the circling MDA.

NOTE: Where straight-in descent gradient criteria are exceeded, only circling MDA shall be authorized.

e. Use of Fixes. Criteria for the use of radio fixes are contained in Chapter 2, Section 8.

f. Minimum Descent Altitude. Criteria for determining the MDA are contained in Chapter 3, Section 2.

734. MISSED APPROACH SEGMENT. Criteria for the missed approach segment are contained in Chapter 2, Section 7. The missed approach point and surface shall be established as follows:

a. Straight-In. The missed approach point is a point on the final approach course which is NOT farther from the FAF than the runway threshold. See Figure 66. The missed approach surface shall commence over the missed approach point at the required height. See Paragraph 274.

b. Circling Approach. The missed approach point is a point on the final approach course which is NOT farther from the final approach fix than the first usable portion of the landing area. The missed approach surface shall commence over the missed approach point at the required height. See Paragraph 274.

735. – 799. RESERVED.